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ABSTRACT

A study was conducted to examine the effect of factors related to the format, presentation style, and order in which ideas are presented on students' recall of chemistry material. Data were obtained from students who viewed three different multi-image presentations in a large lecture hall setting. Following the presentations, students were required to submit a written summary of the material. As the student summaries were analyzed, bits of information reported were tallied on a master sheet listing ideas presented within each half-minute segment of the presentation. Study findings included the following: (1) impact appeared to be greatest during the first 5-minute portion of the presentation, with impact sufficient to cause students to report about 35% of all ideas presented; (2) impact declined, but was relatively constant for the next two 5-minute portions, and dropped to the lowest level during the 15- to 20-minute interval; (3) enumerated items shown with numbers and print on the screen to accompany photographs had heightened impact; (4) enumerated items listed first had greater impact than those listed later; (5) when pairs of parallel ideas were presented, the first one presented was likely to have greater impact than the second; (6) presenting a fixed number of ideas in a shortened time span did not necessarily decrease the impact or retention, unless the material was too compressed for comprehension; and (7) presentations with more than about 40 ideas or bits of information were likely to be less efficient, with impact dropping off as the information load increases. (AYC)

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INFORMATION IMPACT AND FACTORS AFFECTING RECALL

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INFORMATION IMPACT AND FACTORS AFFECTING RECALL

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Does it matter when and how information is presented to students? As we teach chemistry emphasis is generally placed on content, but the manner in which this content is presented can determine the degree of impact, and ultimately affect recall. The investigations we conducted confirmed our hypothesis that several factors relating to the format, presentation style, and order in which these ideas are presented, can affect recall. Consequently, it's not only what is presented, but how it's presented that affects learning.

Data was obtained from students who viewed three different multi-image presentations in a large lecture hall setting. The electronically programmed presentations involved the use of lap-dissolve slide projection on three screens, simultaneously, along with a taped voice and music track. Key ideas could be presented on one screen while examples were flashed on an adjacent screen. In some instances, information was flashed in large print across all three screens, simultaneously. All programs presented numerous concepts and terms in a relatively short time.

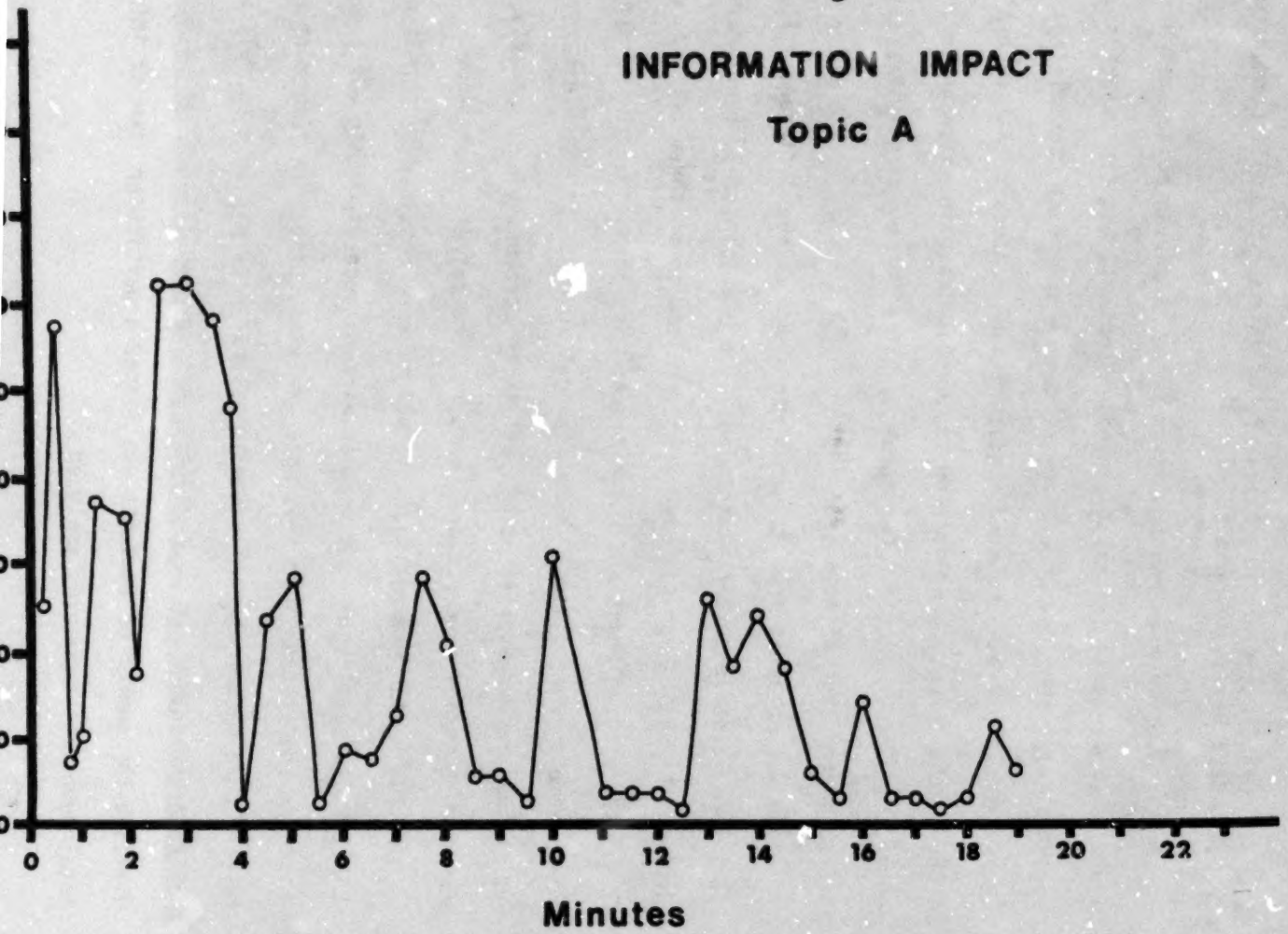
Following the presentations, students were required to submit a written summary, but this did not involve any unusual circumstances, as this was a customary requirement. As the student summaries were analyzed, bits of information reported were tallied on a master sheet listing ideas presented within each half-minute segment of the presentation. A percentage figure for each half-minute was obtained by dividing the number of students who listed a particular item of information by the total number of summaries analyzed.

Since it was possible that student responses were actually measuring some other variable than attention and impact of the presentations, the data were analyzed using the Chi Square technique. The student's total number of items summarized was not found to correlate with any of the following factors: grade point average,

Fig.1

INFORMATION IMPACT

Topic A



grade in previous course in the sequence, SAT verbal, SAT math and Piagettian level obtained by individual testing. For one of the programs, there was a significant correlation between the student's individual score and gender, with females being favored. For all other cases, however, the absence of significant correlations indicated the information obtained could not be attributed to the factors listed. Impact, then, appears to be the variable measured by the student summary sheets, as intended.

IMPACT OF LISTED IDEAS

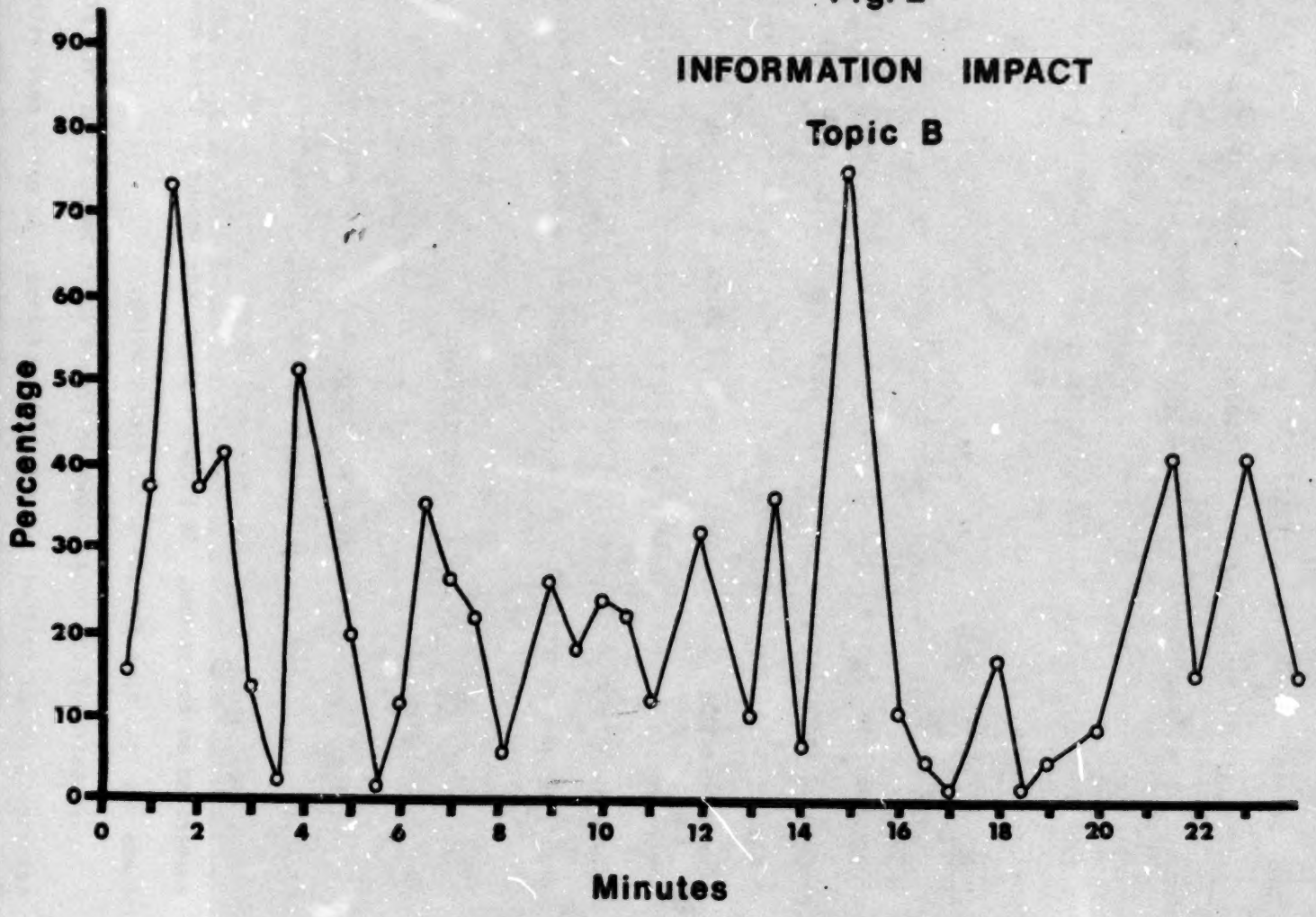
Five key tools of learning were presented during the 2.5-3.75 minute interval of presentation "A." As shown in Figure 1, recall was higher when these items were enumerated and printed on the screen, but there was a decline in information recall as the length of the list increased. The first item was recalled by 62% of the students but the recall dropped off for the third, fourth, and especially the fifth enumerated item. The fact that all five enumerated items had greater impact than information presented before or after the listing indicates the value of clearly specifying and enumerating items which are judged to be of high importance.

INSERT FIGURE 1

At the 1.0-2.5 minute interval and at the 4.5-5.5 minute interval lists of five ways the student can gain points in the course, and five learning activities were stated, along with synchronized, illustrative visuals, but these were not enumerated on the screen. As Figure 1 shows, the impact of these non-enumerated items was less than for the enumerated listing.

By observing the peaks shown in Figure 1, it appears that for student-conceived key ideas, impact fell off as a function of time. An early peak with a 62% response declined sharply to 30% peaks and after 15 minutes of the presentation, no idea

Fig. 2


INFORMATION IMPACT
Topic B
Percentage
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
22
Minutes

received over a 15% response. This trend can be compared with Trenaman's data (McLeish, 1968, p. 6) which reported 20%, 24%, and 15% recall for consecutive 15-minute intervals of a 45-minute lecture. Trenaman's study did not show the early high impact.

A similar decline in impact was also observed for Presentation "B," with the exception of one key idea which occurred at the 15-minute point of the presentation. This key point, which received higher recall than would be predicted, occurred when the second major portion of the presentation was being introduced. Immediately following this momentary peak, however, recalled items dropped to a low level, suggesting that attention could not be effectively held after this point of the presentation.

INSERT FIGURE 2

During the third presentation, several instances occurred where parallel ideas were presented. At the 3.0-3.5 minute interval two terms were presented with 66% and 51% responses respectively. Also, at the 10.0-10.5 minute interval two parallel terms were presented with 31% and 16% responses. The idea presented first in each instance had greater impact. Both parallel ideas presented first had greater impact than those presented later. The presentation appeared to have little impact during the 14-18 minute interval, even though several graphic illustrations were presented during this interval. An attention grabber was used at the 18-20

INSERT FIGURE 3

minute interval where the screens all instantly went black, and the student was asked to summarize the results of what was presented. The answers were in both instances then flashed boldly across the three screens. Impact was heightened,

Fig. 3

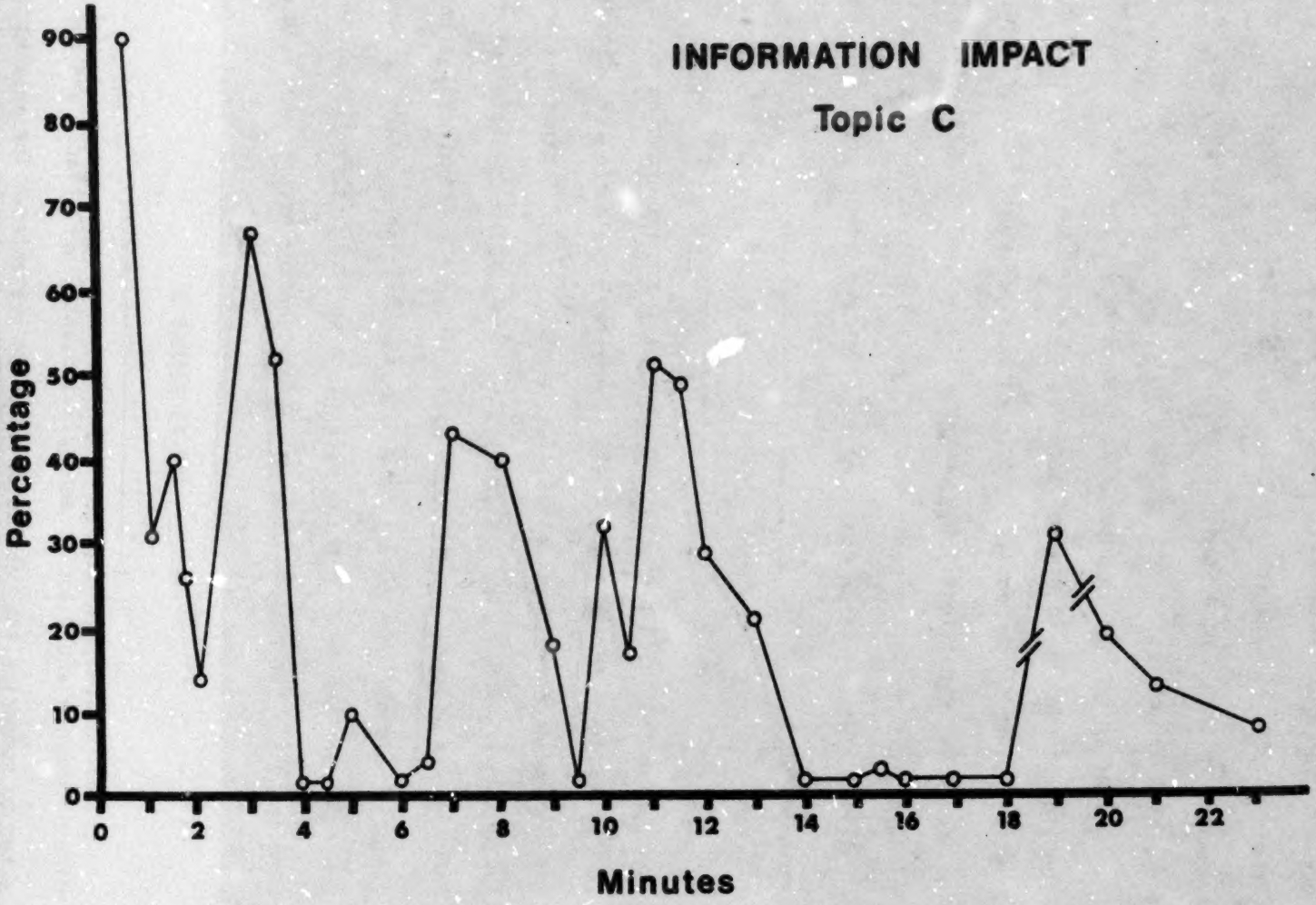
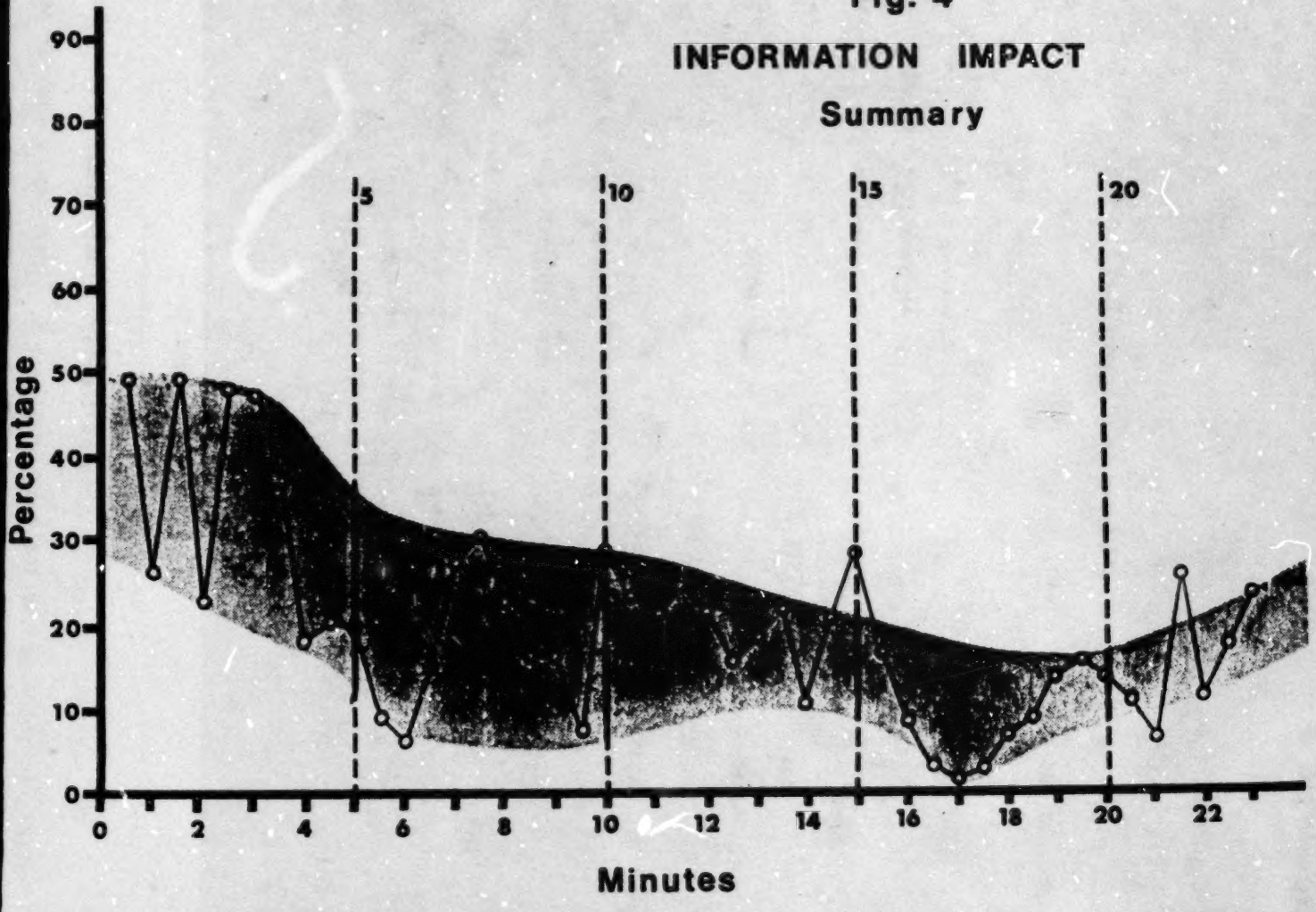

INFORMATION IMPACT
Topic C
Percentage
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
22
Minutes

Fig. 4

INFORMATION IMPACT

Summary



but the first time resulted in a 30% response and the second time this technique was used the response dropped to 18%. It was observed that the technique employed at the 18-20 minute interval was unable to command the impact of even less dramatic portions presented during the first fourteen minutes.

In order to get an overall view of the impact of the three presentations and then draw some tentative conclusions, data for the three presentations were averaged and plotted, again, as a function of time as shown in Figure 4.

INSERT FIGURE 4

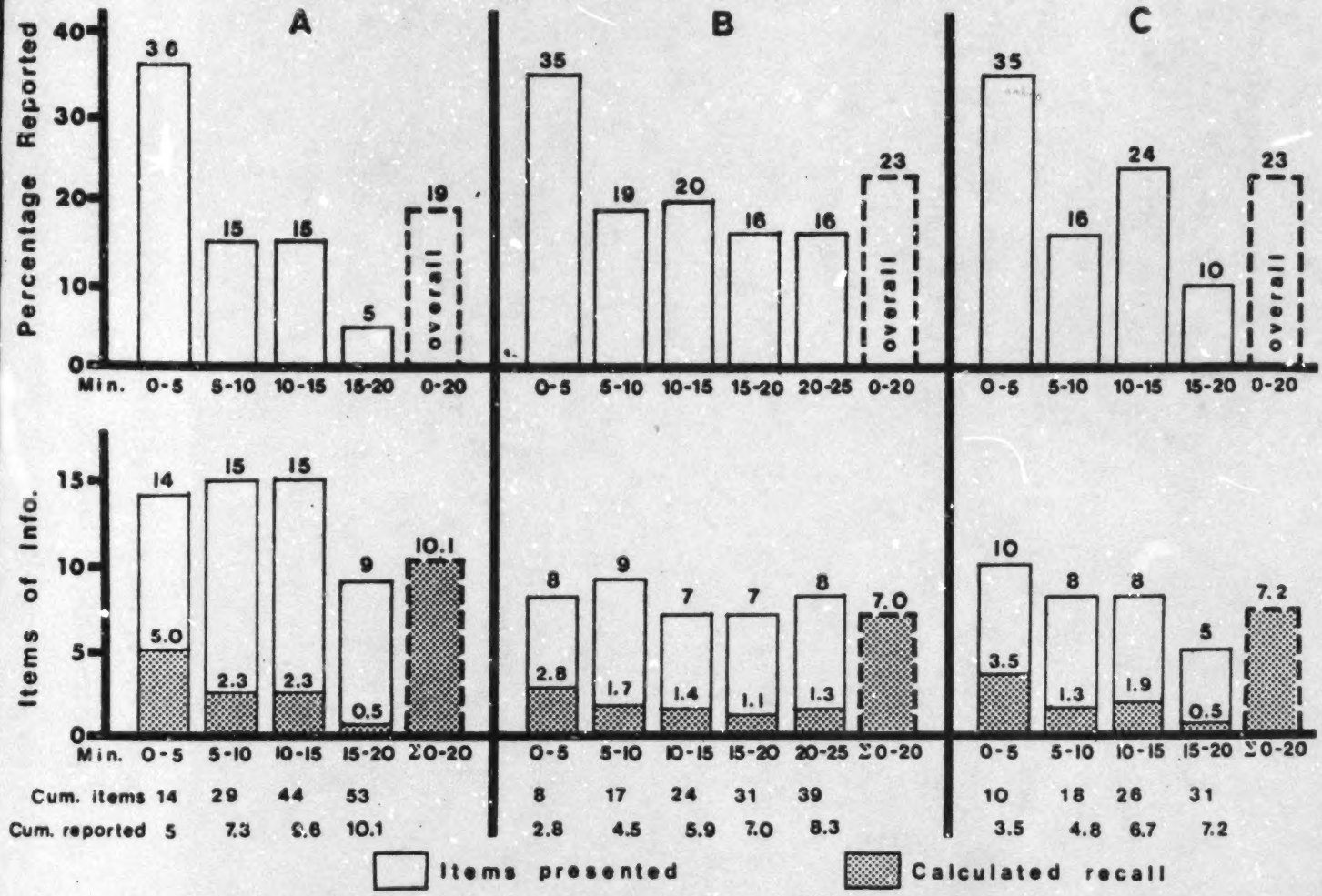
The shaded region can be used to suggest an overall range of impact throughout the three productions. Breaking the presentation summary into five-minute segments for analysis shows that after five minutes, there were instances where the low point of the summary curve dipped lower than for any point during the first five-minute portion. Also, after the five minute point, average impact never again reached the heights obtained during the first five minutes.

The impact appears to remain relatively constant for the 5- to 15-minute interval, with key ideas expected to have sufficient impact for about 30% of the viewers to report it in a summary. During the 15- to 20-minute interval, the average curve again dips to a point lower than previously recorded with the peak impact here expected to be at about 15%. At the end of the presentation impact tends to increase to some degree, but does not appear to rise as high as occurred for any point during the first fifteen minutes.

INSERT FIGURE 5

The averaged impact for each of the five minute segments for the three presentations is shown on the top half of Figure 5. There was a similar percentage of recall for the first five minutes of each of the programs, being 36%, 35%, and 35%,

Fig. 5 PROGRAM LENGTH AND IMPACT



respectively. This varifies uniformity for the introductory portions of the presentations.

During the second five-minute portion of the three presentations, recall ranged from 19% to 15%. Greater differences appeared during the 10- to 15-minute portions with a range of 15% to 24% of the items having sufficient impact that students reported them.

A decline to 5- to 16% was observed during the 15- to 20-minute portion of the presentations, with two of the programs ending during this interval.

Overall average responses of 19%, 23%, and again 23% were obtained for the three presentations, so there appears to be consistency in total impact, and recall. This includes major points of the presentation as well as less significant points, since data was collected consistently over each half-minute portion of the three presentations. On the whole, then, one could roughly expect 20- to 25-percent of all information to have impact sufficient to cause the student to report the item, when required to do so.

INFORMATION LOAD

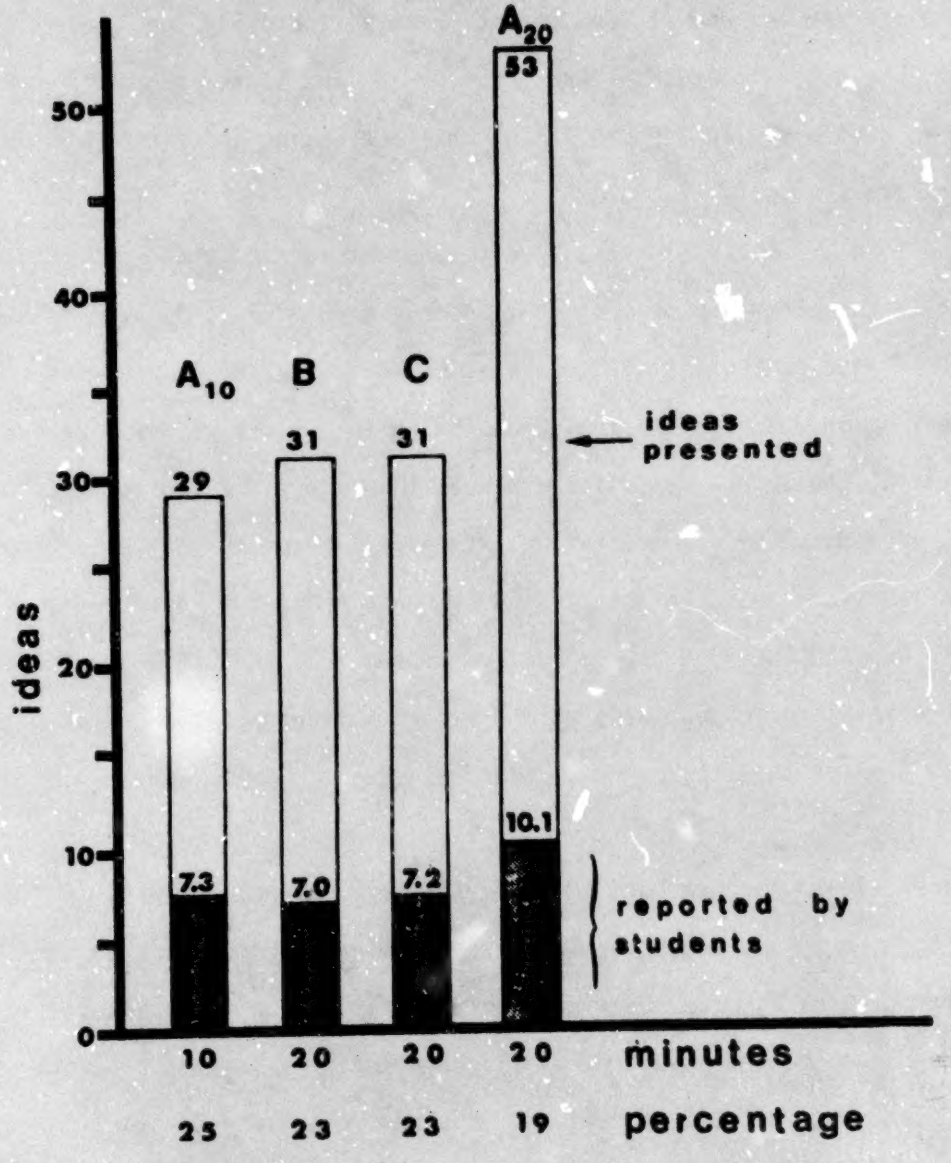
The lower half of Figure 5 allows quick comparison of the numbers of ideas presented and tabulated for the three presentations. Note that presentation "A" included more ideas or bits of information than did either presentations "B" or "C." Cumulative totals for ideas presented are shown beneath the graphs. During the first twenty minutes, the total for presentation "A" was 53 ideas, while for both presentation "B" and "C" the number was 31 ideas, so presentation "A" had the highest information load for the viewer.

By the end of the first ten minutes of presentation "A" 29 items had been presented which compares favorably with the 31 items for the other two presentations at the end of twenty minutes. In other words, a comparable number of items were presented in Presentation "A" in half the time as required for Presentations "B" and "C."

INSERT FIGURE 6

Fig. 6

IDEAS AS A FUNCTION OF TIME



RATE AND RECALL

Ideas are depicted in Figure 6 as a function of time. The first three bars are drawn for comparable numbers of items presented for the three presentations. This required only ten minutes of time in presentation "A" but required twenty minutes of time in presentations "B" and "C." For each of these presentations, means of 7.0-7.3 items were of sufficient impact to be reported by students. Information items presented and student retention were relatively constant, but the time was not, being ten minutes for Presentation "A" and twenty minutes for the other two presentations. It appears, then, that presenting information in less time did not reduce recall.

When the time of twenty minutes is kept constant, presentation "A" packed in 53 ideas, while the other two presented 31 ideas. When more ideas were presented, the recall increased, but the small increase in ideas recalled in conjunction with the increase in time dramatically indicates that a load limit was reached, and above some point, the impact is dulled and recall declines. A key factor, then, in the declining impact of a presentation, may relate possibly to the information load. An explanation, then, for the low 5% response shown for Presentation "A" in the 15- to 20-minute period may be related to the fact that this presentation had a much greater information load, which reached 53 ideas by the end of this segment; much greater than the other presentations.

SUMMARY:

These investigations have been of an exploratory nature, and are, admittedly, limited in scope, but some areas for further investigation emerge: (1) Impact appears to be the greatest for the first 5-minute portion, with impact sufficient to cause students to report about thirty-five percent of all ideas presented during this portion. (2) Impact declined, but was relatively constant for the next two 5-minute portions, and dropped to the lowest level during the 15- to 20-

minute interval. (3) Enumerated items shown with numbers and print on the screen to accompany actual photographs had heightened impact. (4) Enumerated items listed first had greater impact than items listed later. (5) When pairs of parallel ideas are presented, the first one presented is likely to have greater impact than the second. (6) Presenting a fixed number of ideas in a shortened time span does not necessarily decrease the impact or retention, unless the material is too compressed for comprehension. (7) Presentations with more than about forty ideas or bits of information are likely to be less efficient, with impact dropping off as the information load increases.

These points should be of value to those in both educational and advertising fields, and point toward the need for further investigations regarding the impact of presentations and factors which determine effectiveness.

INFORMATION IMPACT AND RECALL

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KEY IDEAS

1. Impact is highest during the first 5 minutes (~35%).
2. Impact declines as length increases.
3. Enumerated items in print increase impact.
4. Enumerated items listed first have greater impact.
5. For parallel ideas, those presented first had greater impact.
6. Dramatic changes in the presentation style increase impact, but are less effective when used repeatedly.
7. Presenting ideas in less time does not necessarily decrease total retention.
8. Impact drops off as the information load approaches about 40 ideas.

RELATED IDEAS

9. Learning is an active process. It involves participation in the form of listening, reading, discussing, problem solving, and lab investigations.
10. Learning occurs in small stages, beginning "here and now."
11. Learning is aided by repetition.
12. Break lectures with real applications and news headlines that relate to the topic.
13. Let the learner know you think the material is meaningful and important.
14. Let the learner know you care about him/her as a person.
15. Use a variety of teaching techniques, within a given lecture period.
16. Be inventive: Try new approaches and gather data.

Not only does science
begin in wonder,
It also ends in wonder.

- Abraham Maslow

INFORMATION IMPACT AND RECALL

LITERATURE SUMMARY

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1. Retention of 1st 10 min. > 2nd 10 min. (Trohanis)

2. The observer is not a sponge; an active process is involved. (Goldstein)

3 Information transmission and reception is increased by more modes of presentation. (Garner)

4. Multi-media presentations have more stimuli to increase information reception. (Hartman)

5. Synergistic effect: fusing sound and sight creates an image "far more powerful than the sum total of their parts." (Friedman)

6. Recall: Audio + Print > Videotape > Print > Audio
   Perceived Involvement: Print > Audio > VTR > Audio + Print (Nasser)

7. Visuals significantly increased learning where objects were involved. (Dwyer)

8. There is no significant difference between learning through visual and tactual stimuli. (Adcock)

9. "Lack of attention is the result of absence of priority attributes in the stimulus, which thus result in it remaining a part of the background..." (Adcock)

10. The number of eye fixations rather than the exposure time is the requirement for recall.
    Pictures fixated once: recognition 45%.
    Pictures fixated 8 times: recognition 70%. (Loftus)

11. Shorter, accelerated lectures are more efficient. (Barabasz, McLeish)

12. Lecturing is likely to be more effective than other mediums when there is a large variation in abilities and backgrounds, since the instructor can vary the rate when he gets clues to inattention, or confusion. (McKeachie)

INFORMATION IMPACT AND RECALL

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